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ABSTRACT

This paper discusses a study of learning retention among junior high school students involved in a field trip in a geography course. The study was based on a model of memory proposed by Robert Gagne and R.T. White. This model of cognitive processes, postulated on the belief that recall of any element is a function of its degree of interlinking in memory with other elements, implies that fieldwork should improve retention because it encourages students to associate various types of verbal knowledge, intellectual skills, images, and episodes. The study involved comparing learning retention of geographical facts and skills among three groups of students (141 in all) in grades eight and nine in two junior high schools in Melbourne, Australia. One group was treated to an excursion stressing processing of meaning of phenomena observed and experienced during the field trip; one group participated in a traditional (passive) excursion; and the final group participated in the same basic geography course but had no excursion. It was hypothesized that (1) students who received either form of fieldwork would outperform students with no field trips on a test of geography knowledge, and (2) that students who participated in the field trip stressing knowledge and idea processing would outperform students who participated in the passive field trip. An achievement test was given to all students soon after the completion of the unit and again 12 weeks later to measure retention. Findings from a statistical analysis of test scores supported both hypotheses. The conclusion is that information and skill links such as those encouraged during the geography field trip discussed in this paper, will aid recall of facts and skills. Tests are included in the appendix. (DB)

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FIELDWORK IN GEOGRAPHY AND LONG TERM MEMORY STRUCTURES

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Fieldwork in Geography and Long Term Memory Structures.

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Abstract

The study was based on the model of memory proposed by Gagné and White. Three treatments were compared in their effects on 8th and 9th graders' learning and retention of geographical facts and skills. On top of a basic program, one treatment had an active excursion, one a passive, and the third no excursion. The excursion treatments were slightly better than the control on initial learning. In retention, the active excursion treatment showed marked superiority over the others, which supports the Gagné and White model and Wittrock's generative model of learning and which has implications for the management of excursions.

Fieldwork in Geography and Long Term Memory Structures

Andrew A. Mackenzie & Richard T. White

Fieldwork has long been a popular strategy among geography teachers. Many authors (e.g. Boehm & Kracht, 1974; Corey, 1968; Everson, 1969; Graves, 1965; Johnson, 1965; Boardman, 1974; Kaplan, 1974; Kracht, 1975; Lewis, 1968; Novak, 1976; Richason & Guell, 1965; Sorrentino & Bell, 1970; Wheeler & Harding, 1965) have advanced rational arguments for the use of fieldwork, but empirical investigations of its effectiveness are rare. Saveland and Pannell (1975) searched the Dissertation Index and the Education Index for the years 1965 to 1975 and the E.R.I.C. Indexes that were available for that period, and found over 400 studies in the field of geographical education, but none had fieldwork as a dependent variable. The Holtgrieve and Mathiason (1975) bibliography of American fieldwork lists only four experimental studies. Since 1975 there have been two substantial investigations: Riban (1976), who found that fieldwork improved initial learning; and Dennis (1977), who found that it improved both initial learning and retention.

These few earlier studies, and the rational arguments cited, generally lack a detailed theoretical base. Recently, theories of learning which can readily be applied to the question of fieldwork's effectiveness have been developed, so the present study uses the theories of Gagné and White (1978) and Wittrock (1974) to guide an investigation of fieldwork.

As part of a model of cognitive processes, Gagné and White (1978) proposed that people's long-term memory stores should be considered to

contain four types of element: verbal knowledge, intellectual skills, images, and episodes. Verbal knowledge consists of facts or beliefs, and may also be termed propositional knowledge. Intellectual skills are memories of how to perform a class of tasks, such as constructing a profile between two points from a contour map, in contrast to memory of a single fact. Images are pictorial or diagrammatic representations of information in memory, and episodes are memories of events in which the individual took part. Gagné and White postulate that recall of any element is a function of its degree of interlinking in memory with other elements, and, as a specific instance, that newly acquired verbal knowledge and intellectual skills will be retained better if they are associated with easily-recalled episodes. Well-conducted fieldwork should provide students with clear episodes, and thus the Gagné and White theory implies that fieldwork should improve retention of related factual knowledge and skills.

However, students can go on a field trip and not form stable episodes, or can fail to link any episode that they do form with other knowledge. Wittrock (1974) argues that all effective learning involves the student in generating meaning for the new information or experience by relating it to prior knowledge; the student must be active in processing the new material. Few geography excursions are planned with this precept as the guiding principle, so there is an opportunity to develop new styles of excursion which do concentrate on processing, or generation of meaning. The present study includes a technique of that style, and compares its effect on retention of verbal knowledge and intellectual skills with those of a more typical excursion and a treatment involving no excursion. The two excursion styles are compared also with respect to their production of episodes that are linked to the verbal knowledge and skills.

The hypotheses that are tested in the study are:

1. Students who receive either form of fieldwork will perform better on a test of knowledge acquired from a learning program in geography than those who do no fieldwork.

Since this study is concerned with the effect of fieldwork on retention of knowledge, ideally the lack of fieldwork should not disadvantage the students as far as initial learning is concerned. However, it seems more realistic to expect that those who go on a field trip with their geography teacher will learn something.

From an experimental point of view, if not a practical one, it would be better if the two types of fieldwork did not affect performance on an early post-test, because it would then be easier to draw inferences from any differences that appeared on a delayed test. Although it was believed impractical to try to bring about no difference between groups that had fieldwork and one which did not, an attempt was made to minimize initial learning differences between the two types of fieldwork, by having them cover the same phenomena. Hence we have the second hypothesis:

2. The form of fieldwork will not affect performance on the knowledge test when the test is given soon after the instruction.

The remaining hypotheses come rather directly from the theory.

3. Fieldwork which encourages processing will be superior to fieldwork which does not, with respect to performance on a test of retention of knowledge, and both will be superior to instruction without fieldwork.

4. Fieldwork which encourages processing will produce greater linking of episodes with geography knowledge than fieldwork which does not encourage processing.

5. Performance on a test of knowledge will be correlated positively with formation of links between the knowledge and episodes.

METHOD

Independent Variables

Method of instruction (three levels: learning program plus processing excursion; learning program plus traditional excursion; learning program alone).

Grade level (two levels: grades 8 and 9).

Sex.

All three three treatments used the same learning program, which was designed to teach facts and skills in the geography of coasts, including information about landforms and plants. The complete set of objectives for the program is set out in Appendix 1, where each objective is classed in relation to one or more of the four types of memory element defined by Gagné and White (1978). The majority of objectives involve verbal knowledge.

The program was 35 pages long, and contained 37 questions, to encourage processing which the students were to answer on separate sheets. Answers to the questions were at the head of the next page in each case. The program was supported with 60 photographs, on 35 mm slides. Other characteristics of the program were:

- statements about expected performance,
- identification of new terms,
- definitions of new terms,
- various forms of prompts,
- strategies to stimulate recall of relevant previous information and subordinate skills,
- worked examples,
- practice at working new data,
- aids such as glass bowls of water, plastic hoops to help simulate tides, world globe,

- reminders,
- multiple exemplars,
- transfer of verbal propositions to maps, diagrams, and slides,
- indications as to the relevance of learning one aspect for application to subsequent aspects,
- sample test items embedded in the text.

The two fieldwork treatments involved visits to a beach, two sets of cliffs, and two mangrove flats. Most of the 60 photographs used with the learning program were taken at these sites.

In the traditional excursion, at each of the five sites the students were given an explanatory field guide on a plastic clipboard. The guide was designed to reinforce the information in the learning program. The teacher dominated. He drew attention to all aspects the students were required to observe, using the field guide as a check list. The students verified data recorded on the guides, but did no recording themselves. All vegetation transects were provided complete on the guides, and the students merely checked them. No unusual events were arranged. In the middle of the excursion the students did have to complete one set of questions, and there were some other minor tasks for them to do, but in general they were recipients of information, not finders.

In the processing excursion, at each site the students received a worksheet on a plastic clipboard, plus a map of the area and a tide table. The teacher supervised while the students, individually and in groups, completed the tasks on the worksheets. The teacher answered any questions which the tasks generated, suggested actions to solve problems, and checked the accuracy of recorded comments and data. Group discussions were held frequently. Students were continually required to <u>do</u> things: observe, sketch, record, answer questions. Several unusual

events were arranged, such as walking through the mud of the mangrove shore, tasting foliage for salinity, scrambling over cliff platforms, wading in the sea.

A detailed comparison of activities in the two forms of excursion is given in Appendix 2. It is emphasised that the students in the traditional group saw the same things as the processing group, and spent the same time at each site. They had information repeated to them more often, but did far less.

Criterion Measures

There were two tests, one of achievement of the objectives of the unit on coastal geography, and the other of the formation of episodes and their linking with other knowledge.

The achievement test was given twice, once soon after the completion of the unit and again 12 weeks later to measure retention. It contained 41 items, some multiple-choice and the remainder short answer.

The link test contained nine items, each of which gave a situation or event to imagine or think about. The scenario was one common to both fieldwork types, but differed in whether the students had participated directly or had watched the teacher. The students were required to select from five alternatives the one which the situation made them think of. They were also asked to add anything else that the situation brought to mind.

Here is an example of a link item:

It is LOW tide and you are standing at the LWM on a mangrove coast. You begin walking back towards HWM.

IT IS DIFFICULT TO WALK - YOU SOMETIMES SINK UP TO YOUR KNEES IN MUD.

Which one of the following facts does this make you think of?

A. Mangrove coasts are spreading seawards.

B. Plants form in zones on a mangrove coast.

C. Soil drainage gets progressively worse across a mangrove coast towards the sea.

D. Tidal range, the difference between HWM and LWM, is large on a mangrove coast.

E. None of these facts.

What else did you think of as you read the situation? (Write on answer sheet please.)

This mangrove mud situation was experienced directly by the processing group and vicariously by the traditional group, who watched the teacher occasionally sink into the mud while they walked on a firm track. Both groups were taught the first four alternatives in the learning program, and all are accurate statements. Alternative C is regarded as the scoring response for linking, as it was referred to at the time of the event.

Sample

The students came from two schools in the outer suburbs of Melbourne, in the bayside region. Each school provided three classes, grade 8 in one school and grade 9 in the other. The classes contained 162 students, but only 141 completed all parts of the investigation, largely because the retention test was held after the summer holidays at the beginning of a new school year, when several students had transferred to other schools.

The three classes within each grade level were not streamed. They were assigned randomly to the three treatments.

Procedure

In both schools the sequence of events was:

Day 1 a.m. Classwork, processing group

p.m. Classwork, control group

Day 2 a.m. Fieldwork, processing group

Day 3 a.m. Classwork, traditional group

p.m. Achievement test, processing group and control group

Day 4 a.m. Fieldwork, traditional group

Day 5 p.m. Achievement test, traditional group

Days 85-89 Achievement test all groups.

Link test, all groups.

All of the teaching was done by one of the investigators (Mackenzie).

In the classwork sessions the students were briefed on the task, and then they read through the programmed booklet on coasts, sometimes with the teacher reading with them. The students answered questions on the answer sheet as they progressed. At appropriate times the teacher projected 35 mm slides of geographical features referred to in the text.

Students who requested assistance or who asked questions were referred to the booklet. The teacher provided no new information.

The program took about two hours to complete, and this did not vary much between classes or between students' within in each class.

The fieldwork sessions proceeded as described earlier. Both forms of excursion took 4½ hours, which included 80 minutes of bus travel. The times of arrival at each site were varied so that at each day the tide conditions were appropriate for the tasks.

During the tests the students were allowed as much time as they needed. All completed the achievement test within an hour; the link test took about ten minutes.

RESULTS

The data include general properties of the tests, cell means, significant F ratios and corresponding measures of strength of association from three-way analyses of variance, and correlations of the linkage test with the two administrations of the achievement tests.

TABLE 1

Means, Standard Deviations, and Reliabilities of Tests

Test	No. of Items	Mean	s.d.	Reliability[1]
Achievement	41	29.7	5.6	.79
Retention	41	20.8	8.4	.90
Link	9	3.0	1.9	.62

[1]Reliabilities calculated using Kuder-Richardson formual 20.

Note: n = 141 in all tests.

TABLE 2

Cell Means

Test	Grade 8						Grade 9					
	Boys			Girls			Boys			Girls		
	Proc.	Trad.	Cont.	Proc.	Trad.	Cont.	Proc.	Trad.	Cont.	Proc.	Trad.	Cont.
Achievement	34.7	27.9	26.0	32.3	28.6	21.4	33.9	31.3	26.2	31.1	29.1	30.1
Retention	31.1	18.1	12.2	27.3	16.9	11.5	31.2	17.3	14.5	29.4	15.6	14.9
Link	5.5	1.9	2.4	5.8	2.3	1.0	6.0	2.6	2.3	5.1	2.7	2.3
n	12	16	12	15	9	8	15	12	13	10	7	12

The scores on the achievement and retention tests were subjected to a three-way, 3x2x2 (Treatment by Grade by Sex) unweighted means analysis of variance. The significant F values are shown in Table 3. The strength of association shown in the table is a measure of the fractions of variance in the dependent variable which is accounted for by the source. The table shows that the only source of variance which has a strong effect is the treatment variable with both tests. The effect of this variable is illustrated in Figure 1.

TABLE 3

Significant F Values from Analysis of Variance

Source of Variance	F	df	p	Strength of Association
Achievement Test				
Instructional Treatment	27.5	2,129		.25
Grade	5.1	1,129		.02
Instruction x Sex	5.8	2,129		.02
Retention test				
Instructional Treatment	149.4	2,129		.67
Sex	6.0	2,129		.01

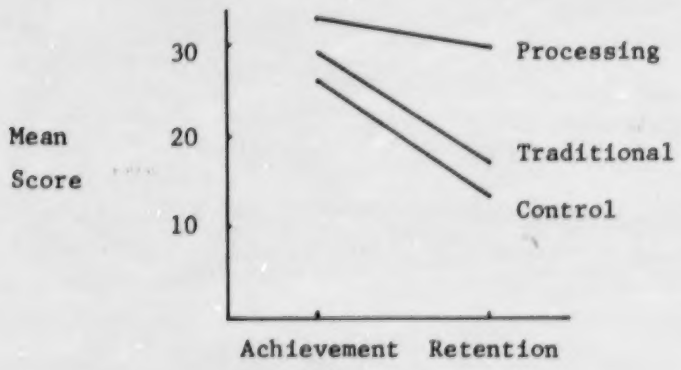

Figure 1. Means of treatment groups on achievement and retention tests.

No analysis of variance was performed on the link scores, partly because they were skewed rather differently within the three groups, but mainly because the differences between the groups are so great that statistical analysis is not required, as can be seen by inspecting Table 2. The overall means on the link test for the three treatment groups are: Processing group, 5.6; Traditional group, 2.4; Control group, 2.0.

Table 4 reports correlations between the link test and the two sets of scores on the achievement test. Values are given for the separate treatment groups as well as the whole sample. In addition, correlations are given for a subset of those 20 of the 41 items which test recall of facts or skills directly illustrated by an event on the excursion.

TABLE 4

Correlations of the Link Test with the Achievement and Retention Tests

Group	n	Achievement	Retention	Achievement (subset)	Retention (subset)
Whole sample	141	.50	.70	.52	.72
Processing group	52	.45	.41	.43	.73
Traditional group	44	.17	-.21	.27	-.15
Control group	45	.16	.07	.10	-.06

DISCUSSION

The results confirm hypotheses 1, 3, and 4 quite clearly, and hypothesis 5 to a degree. They do not confirm hypothesis 2.

Hypothesis 2 is one of experimental convenience. If it had been supported, and no difference observed between the two fieldwork groups or initial achievement, it would have been a little simpler to interpret the positive result for hypothesis 3, concerning retention. As it is, the better retention of the processing group could be in part because those students learned more initially. From a practical point of view the disconfirmation of hypothesis 2 is all to the good: fieldwork which involves extensive processing has been shown to improve initial learning to above the usual level.

The important hypothesis in this investigation is hypothesis 3, concerning the effect of fieldwork processing on retention of related subject-matter. This is confirmed, and the size of the effect is remarkable. Inspection of Table 2 and Figure 1 shows that the processing group suffered relatively little fall off in performance over 12 weeks. If the retention test means are expressed as a percentage of the initial achievement test mean, the processing group shows 90% retention, in marked contrast to the traditional group with 58% and the control group with 51%. The size of the difference makes it unlikely that the initial difference commented on in relation to hypothesis 2 could be wholly responsible. Some other effect is operating, which is the subject of the hypotheses 4 and 5.

Hypotheses 4 and 5 are concerned with checking the theoretical explanation for the positive result of hypothesis 3. The results relevant to these hypotheses are consistent with the notion that episodes have a positive effect on retention of associated subject matter. The low correlations for the traditional and control groups between the link and achievement tests, which may appear contrary to hypothesis 5, are probably a consequence of the low scores of these groups on the link

test. Their scores are barely above chance level for nine multiple choice items each of five alternatives. These low values indicate that unless deliberate efforts are made in instruction to get students to form episodes and link them with other knowledge, such links will not occur, and consequently little value is obtained from an excursion.

The moderate positive correlations for the processing group support Gagné and White's postulate that links with episodes will aid recall of facts and skills. The value of .73 for the retention scores on the subset of items directly illustrated by an event on the excursion gives particularly strong support.

In sum, on the theoretical side the investigation provides considerable support for the postulates that Gagné and White put forward about memory structures and the effects of their interlinking, and for Wittrock's emphasis on the importance of generating meaning by processing of experiences. It also gives practical directions for the conduct of excursions that will make them effective learning experiences.

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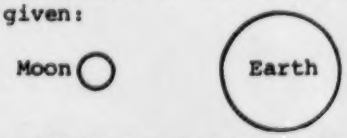
APPENDIX 1

OBJECTIVES OF THE LEARNING PROGRAM

OBJECTIVE NUMBER	OBJECTIVE	SUGGESTED STRUCTURE/ STORAGE FORM IN LTM
1.	WHAT SHAPES A COAST?	
1.1	State that waves, tides and man's activities help shape a coastline.	Proposition
1.2	State what waves are.	Proposition
1.2.1	Explain what waves are, how waves form, move and break.	Proposition
1.2.2	Label, on a diagram, some waves: crest, trough, length, height.	Skill/Image
1.2.3	Explain the difference between spilling waves and plunging waves in respect of relative powers of erosion.	Proposition
1.3	State what tides are.	Proposition
1.3.1	Label a base diagram: LWL and LWM HWL abd HWM T/Range	Skill/Image
1.3.2	State given photos of the same section of coast at different times of tide cycle, whether tide in (i.e. at HWL) or tide out (i.e. LWL).	Skill/Image
1.3.3	State the two main tide producing forces: . moon's gravitational pull . earth's rotation.	Proposition
1.3.4	Illustrate the relationship between earth, moon and sun with the aid of a diagram.	Proposition/Image
1.3.5	Illustrate the effect that the moon (and the sun) have on the seawater of the earth with the aid of a diagram given: 	Proposition/Image
1.3.6	Explain the difference between spring tides and neap tides. Given 2 diagrams of sun/earth/moon: Label one when spring tides occurring. Label one when neap tides occurring.	Proposition/Image
1.3.7	Given a Tide Table, with times in h.m. format: (i) State H and L tide times for specified days in conventional clock format. (ii) Calculate range for specified tide movements. (iii) Identify spring tides and neap tides.	Skill
1.4	State how man may effect a coast.	Proposition
2.	HOW DO COASTS DIFFER?	
2.1	Recognize in the field or from photographs three different Victorian coasts, beach coasts, cliff coasts, mangrove coasts. Discriminate between the three on the basis of appearance, material and process.	Skill/Image

OBJECTIVE NUMBER	OBJECTIVE	SUGGESTED STRUCTURE/ STORAGE FORM IN LTM
2.2	Make correct pairings of these words: Beach - balance - Rock Cliff - eroding - Sand Mangrove - advancing - Mud	Proposition
2.3	Define cliff coast (Basic concept: process of erosion.)	Proposition
2.3.1	Draw a cross section of a cliff with shore platform showing: - Cliff face; Undercut; Shore platform; HWL; LWL.	Image
2.3.2	Explain how a shore platform forms at a cliffed coast. (Rock → undercut at HWL → face collapse → shore platform + debris)	Episode
2.3.3	Appreciate the difficulty plants have colonizing most cliffs.	Image
2.3.4	Describe the usual action man (e.g. local councils) takes to attempt the halting of the natural erosion of cliffs.	Proposition
2.4	Define 'beach coast'. (Basic concept: process of equilibrium or balance.)	Proposition
2.4.1	Draw a cross section of a typical beach system including: HWM/HWL; LWM/LWL; Beach; Primary dune; Secondary dune; Foreshore zone.	Image
2.4.2	Identify the major plants of the Beach Coast dunes.	Proposition/Image
2.4.3	State how people may disrupt a natural beach system.	Proposition
2.5	Define Mangrove Coast. (Basic concept: process of accretion.)	Proposition
2.5.1	Draw a cross section of a Victorian mangrove coast showing: HWL, LWL, 5 plant zones.	Proposition/Image
2.5.2	Identify the major plants of the mangrove shore in the field or from drawings.	Proposition/Image
2.5.3	Describe the spatial distribution of plants on a mangrove coast.	Image
2.5.4	Explain the zones of vegetation on a mangrove coast in respect of the tide dependent variations in soil salinity and soil drainage. (Resultant adaptions of plants to their environment.)	Proposition/Episode
2.5.5	Calculate the density of the distribution of particular plant species given: plant counts, quadrat areas.	Skill
2.5.6	Suggest possible reasons for variations in width of mangrove coast and plant density of given species between different areas in respect of: variations in wave/tide activity, man's activities.	Proposition
2.5.7	State how people may disrupt the natural balance of a mangrove coast.	Proposition

OBJECTIVE NUMBER	OBJECTIVE	SUGGESTED STRUCTURE/ STORAGE FORM IN LTM
	3. HOW IS FIELD DATA COLLECTED?	
3.1	Practice carefully looking at features of the natural environment and perceiving how man has affected this environment.	Image/Episode
3.2	Accurately record field observations; especially . plant names . quadrat counts . vegetation transects . field sketches	Image/Episode

APPENDIX 2

COMPARISON OF FIELDWORK TREATMENTS : HIGHLIGHTS

(Important Episodes in Italics)

SITE	SUBJECT MATTER	OBJECTIVE	ACTIVITIES FOR PROCESSING EXCURSION	ACTIVITIES FOR TRADITIONAL EXCURSION
Seaford Beach (D-1) (E-1)	Transect (shape)	Composite	*Draw transect*. Features as walk past. Sketch.	Observe only, compare to field guide.
	Vegetation	2.4.2	Collect samples in plastic bags. Sketch.	Look, but do not touch.
	Waves	1.1 1.2 1.2.1 1.2.2 1.2.3	*Wade in sea.* Feel waves, swash between toes. Coloured bottles bobbing. Cup experiment in water. Dye episode. Sketch waves. Swimming trunks.	Observe from shore.
	Tides	1.3	Range : Chalk on rod test. HWL/LWL pace. Collect flotsam and jetsam. Field reference to tide tables. Imagine where moon is.	I points out.
	Man	2.4.3	Students locate evidence themselves.	I points out.
	Material and Process	2	*Sand fight*. Throw sand. Feel sand moving in water. Shoes off.	I states. Shoes stay on.
Shire Hall Cliffs (D-2) (E-2)	Cross Section Shape	Composite	Field sketch "Imagine you can fly".	Observe
	Vegetation	2.4.1	*Go and get some plants* (student tied to rope). Impossible.	Observe, listen to I
	Waves	1.2.3	Watch undercutting. Undercutting simulated with geologist's pick.	I described.

SITE	SUBJECT MATTER	OBJECTIVE	ACTIVITIES FOR PROCESSING EXCURSION	ACTIVITIES FOR TRADITIONAL EXCURSION
	Tides	1.3	Range: figure out from cliff.	I informs.
	Materials	2	Handle, scramble over shore platforms. Reference for map - juts out.	Observe from distance. No map.
Schnapper Point	Materials	2	.Reference to map - look along coast. .*Measure size boulders on platform.* .Imagine what happens to c without man's activities. .Undercutting simulated with axe. .*Scramble over platform.* .Dig up rock - discover blocks. .*Throw stones into the sea.*	I centred: I repeats statements. Look, see, do not touch.
	Process		Waves - Undercutting - Falling Shore platform disappearance simulated.	I describes only - repetition, rephrasing.
After process	Man	2.4.3	Common Section : answer questions.	Common Section : answer questions.
Jack's Beach	Cross Section	Composite 2.5.1 2.5.3	*Field sketch*, pacing etc.	Observe. Widths given on field guide.
(D-5) (E-5)	Vegetation	2.5.2	Collect/sketch.	Observe only.
	Tides	1.3	.Field reference to tide tables. .Location of evidence of tide activity. .Range - observe stake planted previous night. .Imagine likely position of Moon. Point to where Moon is.	I tells, repeats, points out, rephrases. No stake planted previous night. Informs.

SITE	SUBJECT MATTER	OBJECTIVE	ACTIVITIES FOR PROCESSING EXCURSION	ACTIVITIES FOR TRADITIONAL EXCURSION
	Waves	1.1 to 1.2.3	.Reference to map. Shattered. .Answer questions on sheet. .Classify waves. Volunteer to get wet.	No map - I tells.
	Vegetation Analysis (Density)	2.5.5	.*Walk through, Test & Classify.* .Peg out quadrats and count plants, calculate density.	Just look. Stay on track. I does, students watch.
Denham's Road	Cross section (shape)	2.5.1	.Comparison with Jack's Beach especially paces. .Reference to map.	I directs students to compare actual with field guide.
(D-4) (E-4)	Tides	1.3	.Field reference to tide tables. .Distance below HWM and LWM. .Range - observe stake (set up for next day). .Carry forward figures given in tide tables.	Completed on field guide. Informed. No Tide Tables.
	Waves	1.1 to 1.2.3	.Reference to map : sheltered. Observe and record.	No map. Informed by I.
	Vegetation	2.5.2	.Students quizzed, compare samples from Jack's Beach to those here.	Students reminded of species.
	Man	2.5.7	.They list visible evidence here in site	I points out.
	Soil drainage of each zone	2.5.4	.*Students get into each zone.* .Record observations of soil drainage on transect. .*They get muddy, very muddy. Rope around waist of volunteer.*	Students stay on track for most part, noting changes. .They stay clean.

SITE	SUBJECT MATTER	OBJECTIVE	ACTIVITIES FOR PROCESSING EXCURSION	ACTIVITIES FOR TRADITIONAL EXCURSION
	Soil salinity	2.5.4	.Quick reminder re plant requirements, etc. .*Taste test for saltiness*. .Feel test. .Differences between zones recorded on transect.	Students stay on track, changes merely informed.
	Plant adaptions (mangrove)	2.5.4	.Sketch mangroves - roots - pneumatorphores (up nose, suck). - seedlings (float)	Compare provided sketch with actual. I explains plant adaptions again.
	Shore Process (encroachment)	2.5.6	.Dig up new mangrove (just a few). .Sketch "baby" mangrove. (Seaward). .*Try to walk through*. .Observe sand around roots, feel sand.	Briefing only, repetitive, emphasis.
	Vegetation Analysis	2.5.5	.*Students do quadrat count*. .Compare with previous data. .Discussion why (reference to map in plastic folder).	I does. Compares with Jack's Beach figures and tells why different. No map.